

SS EN 1997-2:2010(2020)
EN 1997-2:2007, IDT
(ICS 91.010.30; 93.020)

SINGAPORE STANDARD

Eurocode 7 : Geotechnical design
– Part 2 : Ground investigation and testing

The national standard is the identical implementation of EN 1997-2:2007 and is adopted with permission of CEN, Rue de la Science 23 B - 1040 Brussels

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National Foreword

This Singapore Standard was prepared by the Technical Committee on Civil and Geotechnical Works under the purview of the Building and Construction Standards Committee.

This SS EN is the identical implementation of EN 1997-2 : 2007 'Eurocode 7 : Geotechnical design – Part 2 : Ground investigation and testing (incorporating the CEN Corrigendum EN 1997-2:2007/AC:June 2010) and is adopted with permission of CEN, Rue de la Science 23 B - 1040 Brussels.

Attention is drawn to the following:

- The comma has been used throughout as a decimal marker whereas in Singapore Standards, it is a practice to use a full point on the baseline as the decimal marker.
- The Singapore Standards which implement international or European publications referred to in this document may be found in the SS Electronic Catalogue at: <http://www.singaporestandardseshop.sg>.

The EN gives values with notes indicating where national choices may be made. Where a normative part of the EN allows for national choice to be made, the range and possible choice will be given in the normative text, and a note will qualify it as a Nationally Determined Parameter (NDP). NDPs can be a specific value for a factor, a specific level or class, a particular method or a particular application rule if several are proposed in the EN.

The requirements of this SS EN 1997-2 : 2010 are to be read in conjunction with the Singapore National Annex (NA) to SS EN 1997-2 : 2010 which contains information on the Singapore Nationally Determined Parameters and is published separately.

SS EN 1997-2 gives guidance for the planning and interpretation of geotechnical laboratory and field tests that are used for the support of geotechnical design of buildings and civil engineering works.

SS EN 1997-2 is intended for clients, designers, geotechnical laboratories, field testing laboratories and public authorities.

When using SS EN 1997-2, particular regard should be paid to the underlying assumptions and conditions given in 1.3.

The six sections of SS EN 1997-2 are complemented by 24 informative annexes.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. SPRING Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as “mature standards”. Mature standards will not be subject to further review, unless there are requests to review such standards.*
2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*
3. *Compliance with a SS or TR does not exempt users from any legal obligations.*

EUROPEAN STANDARD

EN 1997-2

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EUROPÄISCHE NORM

March 2007

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Supersedes ENV 1997-2:1999, ENV 1997-3:1999
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English Version

Eurocode 7 - Geotechnical design - Part 2: Ground investigation and testing

Eurocode 7 - Calcul géotechnique - Partie 2:
Reconnaissance des terrains et essais

Eurocode 7 - Entwurf, Berechnung und Bemessung in der
Geotechnik - Teil 2: Erkundung und Untersuchung des
Baugrunds

This European Standard was approved by CEN on 12 June 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 1997-2: 2007) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2007, and conflicting national standards shall be withdrawn at the latest by March 2010.

This document supersedes ENV 1997-2:1999 and ENV 1997-3:1999.

CEN/TC 250 is responsible for all Structural Eurocodes.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Background of the Eurocode programme

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonization of technical specifications.

Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works, which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement¹ between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council's Directives and/or Commission's Decisions dealing with European standards (e.g. the Council Directive 89/106/EEC on construction products - CPD - and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode :	Basis of Structural Design
EN 1991	Eurocode 1:	Actions on structures

¹ Agreement between the Commission of the European Communities and the European Committee for Standardization (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

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EN 1992	Eurocode 2:	Design of concrete structures
EN 1993	Eurocode 3:	Design of steel structures
EN 1994	Eurocode 4:	Design of composite steel and concrete structures
EN 1995	Eurocode 5:	Design of timber structures
EN 1996	Eurocode 6:	Design of masonry structures
EN 1997	Eurocode 7:	Geotechnical design
EN 1998	Eurocode 8:	Design of structures for earthquake resistance
EN 1999	Eurocode 9:	Design of aluminium structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that Eurocodes serve as reference documents for the following purposes:

- as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 – Mechanical resistance and stability – and Essential Requirement N°2 – Safety in case of fire;
- as a basis for specifying contracts for construction works and related engineering services;
- as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs).

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents² referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards³. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

² According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for harmonised ENs and ETAGs/ETAs.

³ According to Art. 12 of the CPD the interpretative documents shall :

- a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;
- b) indicate methods of correlating these classes or levels of requirement with the technical specifications, e.g. methods of calculation and of proof, technical rules for project design, etc. ;
- c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.

The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

National Standards implementing Eurocodes

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National annex.

The National annex may only contain information on those parameters, which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, i.e.:

- values and/or classes where alternatives are given in the Eurocode;
- values to be used where a symbol only is given in the Eurocode;
- country specific data (geographical, climatic), *e.g.* snow map;
- the procedure to be used where alternative procedures are given in the Eurocode.

It may also contain:

- decisions on the application of informative annexes;
- references to non-contradictory complementary information to assist the user to apply the Eurocode.

Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works⁴. Furthermore, all the information accompanying the CE Marking of the construction products, which refer to Eurocodes, should clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific to Eurocode 7

EN 1997-2 gives guidance for the planning and interpretation of geotechnical laboratory and field tests that are used for the support of geotechnical design of buildings and civil engineering works.

EN 1997-2 is intended for clients, designers, geotechnical laboratories, field testing laboratories and public authorities.

EN 1997-2 is intended to be used with EN 1997-1.

When using EN 1997-2, particular regard should be paid to the underlying assumptions and conditions given in 1.3.

The six sections of EN 1997-2 are complemented by 24 informative annexes.

National annex for EN 1997-2

The national standard implementing EN 1997-2 should have a national annex containing all information concerning the application of EN 1997-2 in the relevant country.

⁴ See Art.3.3 and Art.12 of the CPD, as well as 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

Section 1 General

1.1 Scope

1.1.1 Scope of Eurocode 7

- (1) EN 1997 is intended to be used in conjunction with EN 1990:2002, which establishes the principles and requirements for safety and serviceability, describes the basis of design and verification and gives guidelines for related aspects of structural reliability.
- (2) EN 1997 is intended to be applied to the geotechnical aspects of the design of buildings and civil engineering works. It is subdivided into various separate parts (see 1.1.2).
- (3) EN 1997 is concerned with the requirements for strength, stability, serviceability and durability of structures. Other requirements, e.g. concerning thermal or sound insulation, are not considered.
- (4) Numerical values of actions on buildings and civil engineering works to be taken into account in design are provided in EN 1991 for the various types of construction. Actions imposed by the ground, such as earth pressures, shall be calculated according to the rules of EN 1997.
- (5) Separate European Standards are intended to be used to treat matters of execution and workmanship. They are denoted in the relevant sections.
- (6) In EN 1997 execution is covered to the extent that is necessary to conform to the assumptions of the design rules.
- (7) EN 1997 does not cover the special requirements of seismic design. EN 1998 provides additional rules for geotechnical seismic design, which complete or adapt the rules of this standard.

1.1.2 Scope of EN 1997-2

- (1) EN 1997-2 is intended to be used in conjunction with EN 1997-1 and provides rules supplementary to EN 1997-1 related to:
- planning and reporting of ground investigations;
 - general requirements for a number of commonly used laboratory and field tests;
 - interpretation and evaluation of test results;
 - derivation of values of geotechnical parameters and coefficients.

In addition, examples of the application of field test results to design are given.

NOTE Establishment of characteristic values is covered in EN 1997-1.

- (2) This document gives no specific provisions for environmental ground investigations.
- (3) Only commonly used geotechnical laboratory and field tests are covered in this standard. These were selected on the basis of their importance in geotechnical practice, availability in

commercial geotechnical laboratories and existence of an accepted testing procedure in Europe. The laboratory tests on soils are mainly applicable to saturated soils.

NOTE It is expected that updates of the present standard will gradually include laboratory and field tests covering additional aspects of soil and rock behaviour.

(4) The provisions of this standard apply primarily to projects of geotechnical category 2, as defined in 2.1 of EN 1997-1:2004. The ground investigation requirements for category 1 projects are normally limited as the verifications often will be based on local experience. For geotechnical category 3 projects, the amount of investigations required will normally be at least the same as indicated for geotechnical category 2 projects in the following sections. Additional investigations and more advanced tests, related to the circumstances that place a project in geotechnical category 3, may be necessary.

(5) The derivation of parameter values is dedicated primarily to the design of pile and spread foundations based on field testing, as detailed in Annexes D, E, F and G of EN 1997-1:2004.

1.2 Normative references

(1) The following normative documents contain provisions which, through reference in this text, constitute provisions of this European Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this European Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the last edition of the normative document referred to applies.

EN 1990:2002	<i>Eurocode — Basis of structural design</i>
EN 1997-1:2004	<i>Eurocode 7 — Geotechnical design — Part 1: General rules</i>
EN ISO 14688-1	<i>Geotechnical investigation and testing — Identification and classification of soil — Part 1: Identification and description</i>
EN ISO 14688-2	<i>Geotechnical investigation and testing — Identification and classification of soil — Part 2: Classification principles</i>
EN ISO 14689-1	<i>Geotechnical investigation and testing — Identification and classification of rock - Part 1: Identification and description</i>
EN ISO 22475-1 ⁵	<i>Geotechnical investigation and testing — Sampling by drilling and excavation and groundwater measurements — Part 1: Technical principles of execution</i>
AC1 EN ISO 22476-1 ⁵	<i>Geotechnical investigation and testing — Field testing — Part 1: Electrical cone and piezocone penetration tests AC1</i>
EN ISO 22476-2	<i>Geotechnical investigation and testing — Field testing — Part 2: Dynamic probing</i>
EN ISO 22476-3	<i>Geotechnical investigation and testing — Field testing — Part 3: Standard penetration test</i>
EN ISO 22476-4 ⁵	<i>Geotechnical investigation and testing — Field testing — Part 4: Ménard pressuremeter test</i>
EN ISO 22476-5 ⁵	<i>Geotechnical investigation and testing — Field testing — Part 5: Flexible dilatometer test</i>
EN ISO 22476-6 ⁶	<i>Geotechnical investigation and testing — Field testing — Part 6: Self boring pressuremeter test</i>
AC1 EN ISO 22476-7 ⁶	<i>Geotechnical investigation and testing — Field testing — Part 7: Borehole jack test AC1</i>

⁵ to be published

AC1 ⁶ to be published AC1

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EN ISO 22476-8⁶ *Geotechnical investigation and testing — Field testing — Part 8: Full displacement pressuremeter test*

EN ISO 22476-9⁶ *Geotechnical investigation and testing — Field testing — Part 9: Field vane test*

AC1 EN ISO 22476-12 *Geotechnical investigation and testing — Field testing — Part 12: Mechanical CPT **AC1***

EN ISO 22476-13⁶ *Geotechnical investigation and testing — Field testing — Part 13: Plate loading test*

NOTE The Bibliography presents a number of CEN ISO Technical Specifications (CEN ISO/TS), giving information on procedures, equipment, evaluation and presentation for some field and laboratory tests. These technical specifications may become European/ISO standards in due time. The National Standards Body may decide to keep its national standard in force during the lifetime of a CEN ISO/TS. National Annexes to EN 1997-2 may give information regarding national practise involved.